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BYE-42249/65
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5 November 1965

MEMORANDUM FOR THE RECORD

SUBJECT: System 12B Antenna Patterns, Preliminary Analysis

1. In response to a requirement laid on by Headquarters, LAC has performed antenna pattern measurements on the S/C-band portion of a production unit of System 12B. Recent System 12B performance during missions has not produced indication of FAN SONG presence at critical times. The corner reflector used on the antenna system of the production units is not the same design as the corner reflector used on the developmental prototypes. This has raised the question as to whether the different design could be a contributing factor. LAC conducted the tests using a partial fuselage mock-up.

2. On 2 November 1965, [redacted], ASD/OEL, during a telephone conversation with [redacted], requested a set of prototype antenna pattern measurements. [redacted] stated that the patterns will be sent to Headquarters as soon as possible; but since [redacted] who made the measurements, was out of town, he may have difficulty in locating them. When the patterns of the prototype system are received, a comparison of the prototype antenna system and the production antenna system will be made. 25X1 25X1 25X1 25X1

3. The measurements made by LAC of the production antenna are very comprehensive. Patterns were made of all four monopoles over a wide range of depression angles. The patterns include system configurations with the 3 db pad inserted and removed and the r.f. filter inserted and removed. Measurements were made at frequencies of 3.0 Kmc, 3.95 Kmc and 5.0 Kmc. Calibration of the System 12B antenna gain was made by referring the monopole gain to that of a 10 db standard gain horn. Eight volumes of data were compiled as a result of this effort.

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4. Summary of preliminary analysis:

a. At a measurement frequency of 3 Kmc, the r.f. filter inserted and the 3 db pad removed, antenna patterns appear to be adequate at depression angles of zero (0) degrees through about 50 degrees. At depression angles greater than 50 degrees, back lobe structures tend to build up and a decrease in gain becomes evident. When data is evaluated on the basis of warning and D/F capability during a mission, the system should be satisfactory.

b. At a measurement frequency of 3.95 Kmc, the r.f. filter inserted and the 3 db pad removed, antenna patterns appear to be adequate at depression angles of zero (0) degrees through about 40 to 50 degrees. At greater depression angles, gain is reduced and back lobe structures tend to build up. The monopole antenna used to sense the forward sector exhibits a peculiar pattern structure at a depression angle of 70 degrees. At that angle, there is a null instead of a main lobe, and in its stead side lobes exist to the port and starboard. This effect, under the conditions stated, is not conducive to accurate D/F in the forward quadrant. It must be emphasized, however, that with a depression angle of 70 degrees and normal operational altitude, the program aircraft would be less than five (5) ground miles from a hostile site. Therefore, even though the pattern at certain depression angles leaves much to be desired, the practical effect may be of little or no consequence.

c. At a measurement frequency of 5 Kmc, the r.f. filter inserted and the 3 db pad removed, patterns appear to be adequate at depression angles of zero (0) through about 30 to 40 degrees. At greater depression

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angles, the main lobe structures of the forward and aft monopoles become quite irregular. Again, the practical implication of the patterns as they influence mission effectiveness must be considered. Depression angles of 30 to 40 degrees represent distances of 10 to 20 ground miles to a hostile site.

5. Intelligence reports indicate that in the case of S-band FAN SONG radars, intercepts tend to be centered at about 3 Kmc. In this frequency range, preliminary analysis indicates the System 12B patterns are quite good. When considering the C-band FAN SONG, most intercepts fall at about 5 Kmc. The measurement effort has shown that the patterns at this frequency are not as good as those at 3 Kmc; however, they are probably acceptable.

6. If C-band radars are anticipated in the geographic areas of interest, a program to improve System 12B antenna patterns could be in order. However, before embarking on such a program, the effects of the patterns as they relate to vehicle vulnerability should be considered thoroughly.

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